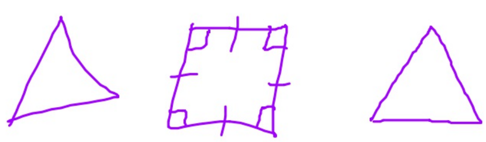
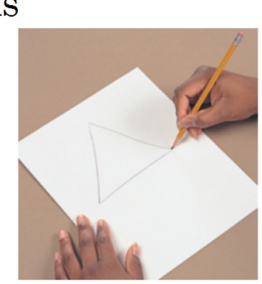
Duplicating Segments and Angles 9/22/16

IWBAT
- distinguish among sketches, drawings, and constructions, and
- discover construction methods to duplicate a segment, an angle, and a polygon.

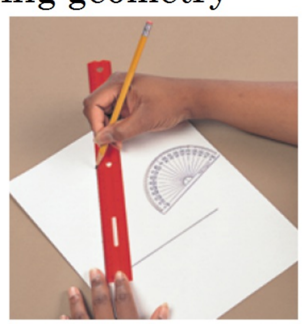
Duplicating Segments and Angles 9/22/16

Sketch - made freehand without geometry tools





Drawing - made carefully and accurately using geometry tools such as a ruler and a protractor

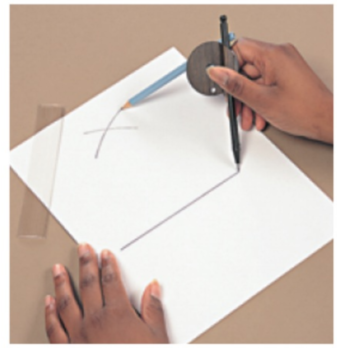


When you sketch or draw you use special marks for right angles, parallel segments, and congruent segments and angles.

IWBAT distinguish among sketches, drawings, and constructions, and discover construction methods to duplicate a segment, an angle, and a polygon.

Duplicating Segments and Angles

When you construct an equilateral triangle with a compass and straightedge, you don’t rely on measurements from a protractor ruler. You must use only a compass and a straightedge. This method of construction guarantees that your measuring triangle is equilateral.



IWBAT distinguish among sketches, drawings, and constructions, and discover construction methods to duplicate a segment, an angle, and a polygon.

Duplicating Segments and Angles

When you construct an equilateral triangle with patty paper and straightedge, you fold the paper and trace equal segments. You may use a straightedge to draw a segment, but you may not use a compass or any measuring tools.

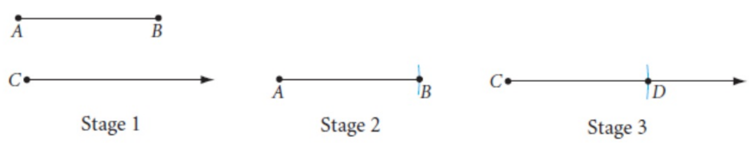
IWBAT distinguish among sketches, drawings, and constructions, and discover construction methods to duplicate a segment, an angle, and a polygon.

Duplicating Segments and Angles

Copying a Segment

- compass
- ruler/straightedge

1. Using your straightedge, draw $\overline{AB}$ and $\overrightarrow{C}$ on your paper where $\overrightarrow{C}$ is longer than $\overline{AB}$.
2. Place the spike of your compass at A and the pencil tip at B. Tighten the compass to maintain this distance.
3. Place your compass spike at C and draw a small arc across $\overrightarrow{C}$.
4. Label the point where the arc crosses $\overrightarrow{C}$ point D.



Use your ruler to measure $\overline{AB}$ and $\overline{CD}$. How do the lengths compare?

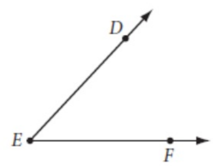
IWBAT distinguish among sketches, drawings, and constructions, and discover construction methods to duplicate a segment, an angle, and a polygon.

Duplicating Segments and Angles

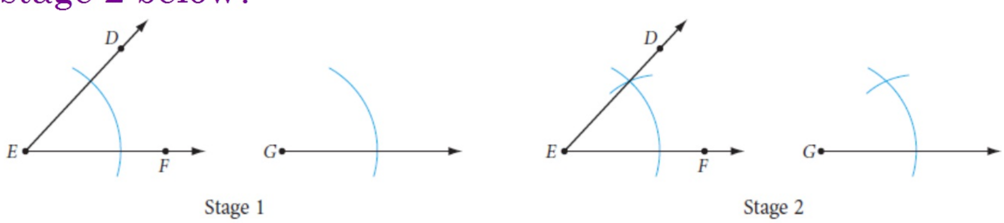
Copying an Angle

- compass
- straightedge

Draw angle DEF.



What steps will be needed to replicate stage 1 and stage 2 below?



What is the final step in duplicating angle DEF?

Using a straightedge, draw the ray from G through the intersection

Measure angle DEF and angle G with a protractor. What can you say about the angles?

IWBAT distinguish among sketches, drawings, and constructions, and discover construction methods to duplicate a segment, an angle, and a polygon.

Duplicating Segments and Angles

Exercises DG p. 145 #1-8, 10

IWBAT distinguish among sketches, drawings, and constructions, and discover construction methods to duplicate a segment, an angle, and a polygon.

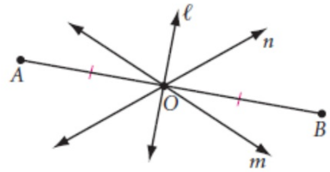
Constructing Perpendicular Bisectors 9/23/16

IWBAT
- discover a method of constructing perepependicular bisectors and midpoints, and
- make conjectures about perpendicular bisectors

Constructing Perpendicular Bisectors

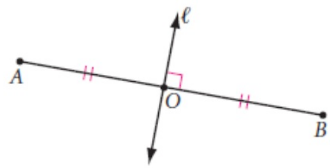
9/23/16

A segment bisector is any line, ray, or segment in a plane that passes through the midpoint of a segment in a plane.



Lines ℓ, m, and n bisect $\overline{AB}$.

One, and only one, of these segment bisectors is perpendicular to the line segment and is called the perpendicular bisector.



IWBAT discover a method of constructing perependicular bisectors and midpoints, and make conjectures about perpendicular bisectors.

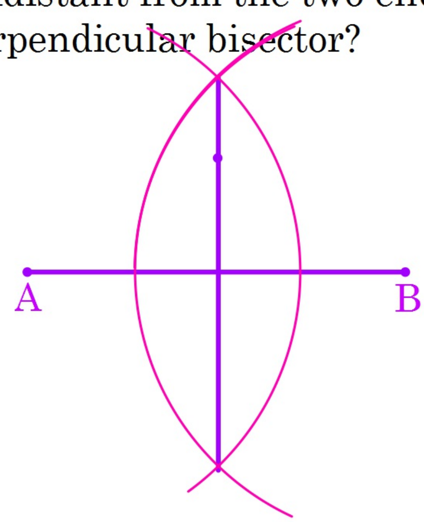
Constructing Perpendicular Bisectors

Perpendicular Bisector Conjecture

If a point is on the perpendicular bisector of a segment, then it is equidistant from the endpoints.

↳ equally distant

A point is equidistant from the two ends of the line segment. Is it on the perpendicular bisector?

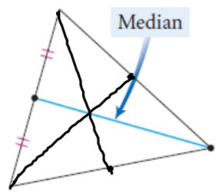


IWBAT discover a method of constructing perependicular bisectors and midpoints, and make conjectures about perpendicular bisectors.

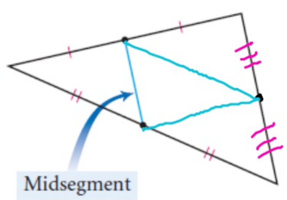
Constructing Perpendicular Bisectors

Converse of the Perpendicular Bisector Conjecture

If a point is equidistant from the endpoints of a segment, then it is on the perpendicular bisector of the segment.



A median of a triangle connects one vertex to the midpoint of the opposite side.



A midsegment of a triangle connects the midpoints of two sides of a triangle

IWBAT discover a method of constructing perependicular bisectors and midpoints, and make conjectures about perpendicular bisectors.

Constructing Perpendicular Bisectors

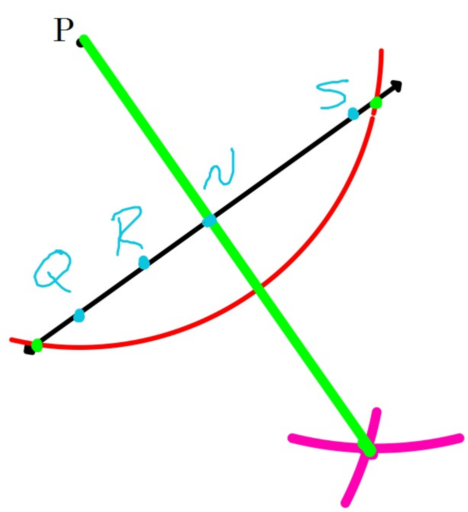
Exercises DG pp. 149-150 #1-5, 7, 8

IWBAT discover a method of constructing perependicular bisectors and midpoints, and make conjectures about perpendicular bisectors.

IWBAT
- discover methods of constructing perpendiculars to a line from a point not on the line and from a point on the line, and
- discover a method for finding the shortest path from a point to a line

You cannot bisect and infinitely long line, but you can draw a segment which is perpendicular to it.

PS = 59
PR = 47
PQ = 56
PN = 45



IWBAT discover methods of constructing perpendiculars to a line from a point not on the line and from a point on the line, and discover a method for finding the shortest path from a point to a line

Constructing Perpendiculars to a Line

Along line AB, label three other points Q, R, and S. Measure the distance from P to these points and determint which of the four distances is shortest.

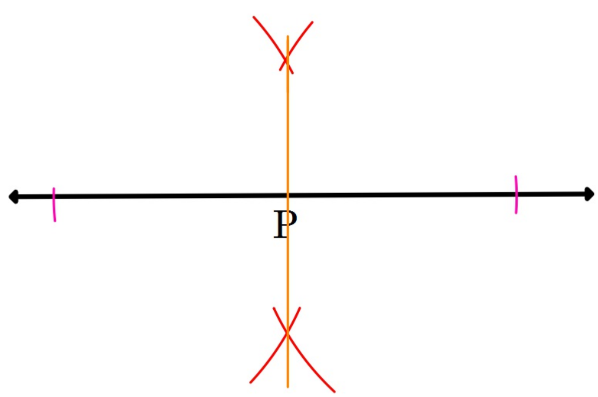
Shortest Distance Conjecture

The shortest distance from a point to a line is measured along the perpendicular segment from the point to the line.

IWBAT discover methods of constructing perpendiculars to a line from a point not on the line and from a point on the line, and discover a method for finding the shortest path from a point to a line

Constructing Perpendiculars to a Line

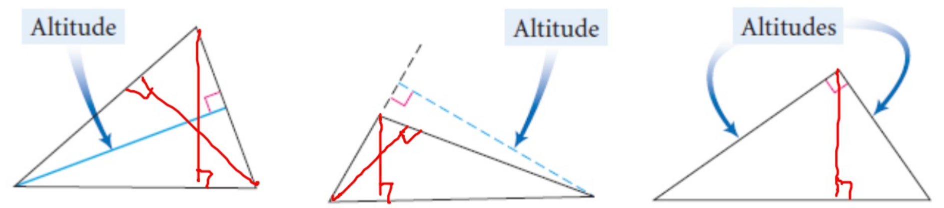
Construct a perpendicular to the line from a point on the line.



IWBAT discover methods of constructing perpendiculars to a line from a point not on the line and from a point on the line, and discover a method for finding the shortest path from a point to a line

Constructing Perpendiculars to a Line

An altitude of a triangle is a perpendicular segment from a vertex to the opposite side or to a line containing the opposite side.

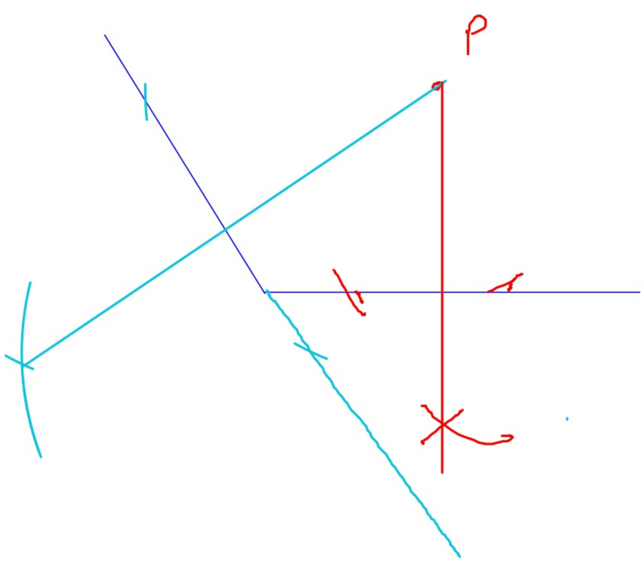


An altitude can be inside the triangle. An altitude can be outside the triangle. An altitude can be one of the sides of the triangle.

IWBAT discover methods of constructing perpendiculars to a line from a point not on the line and from a point on the line, and discover a method for finding the shortest path from a point to a line

Constructing Perpendiculars to a Line

Exercises DG pp. 154-155 #1-5, 10-12

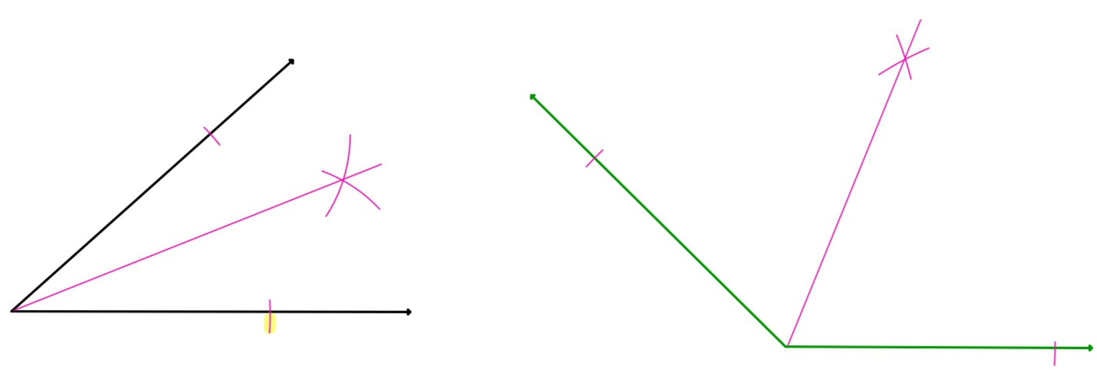


IWBAT discover methods of constructing perpendiculars to a line from a point not on the line and from a point on the line, and discover a method for finding the shortest path from a point to a line

IWBAT
- discover methods of constructing an angle bisector,
- make a conjecture about angle bisectors, and
- explore how to construct special angles by dividing and combining 60°and 90°angles.

Recall that an angle bisector divides an angle into two congruent angles.While an angle bisector is usually a ray, it can be a segment if that segment lies upon the ray and passes through the vertex.

Find a method of bisecting this angle with a compass.



IWBAT discover methods of constructing an angle bisector, make a conjecture about angle bisectors, and explore how to construct special angles by dividing and combining 60°and 90°angles.

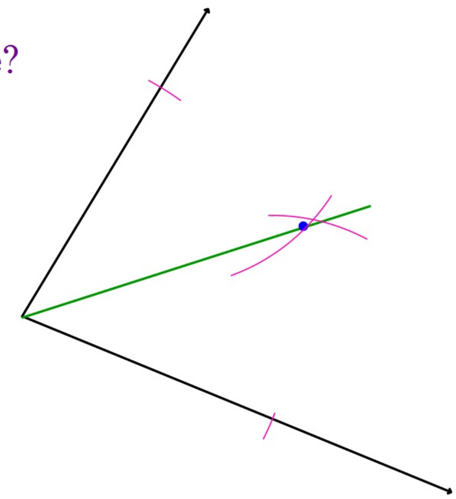
Constructing Angle Bisectors

Angle Bisector Conjecture

If a point is on the bisector of an angle, then it is equidistant from the sides of the angle.

Is the converse true?

Yes



IWBAT discover methods of constructing an angle bisector, make a conjecture about angle bisectors, and explore how to construct special angles by dividing and combining 60°and 90°angles.

Constructing Angle Bisectors

Exercises DG pp. 158-159 #1-8 all

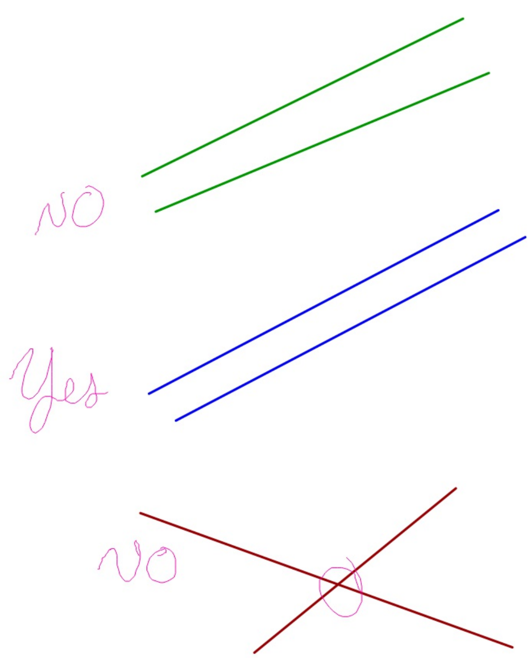
IWBAT discover methods of constructing an angle bisector, make a conjecture about angle bisectors, and explore how to construct special angles by dividing and combining 60°and 90°angles.

IWBAT discover methods of constructing parallel lines.

Constructing Parallel Lines 10/03/16

What are parallel lines?

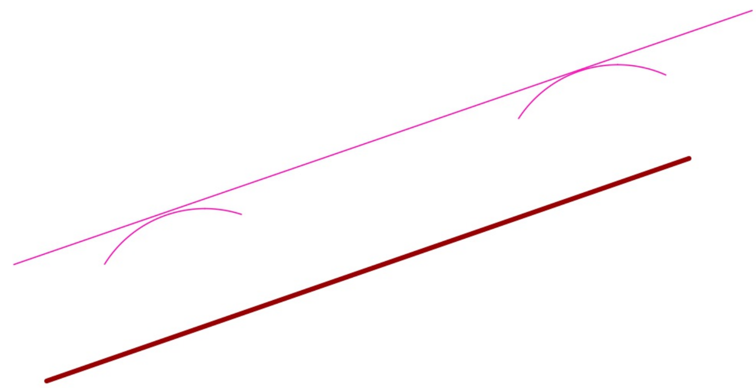
Two or more lines on a plane with the same slope and they never intersect



IWBAT discover methods of constructing parallel lines.

Constructing Parallel Lines

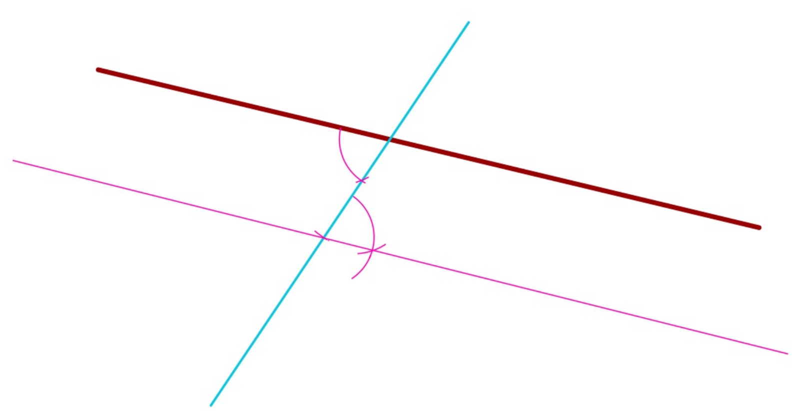
Construct a line parallel to this one with a compass and straightedge.



IWBAT discover methods of constructing parallel lines.

Constructing Parallel Lines

Construct a line parallel to this one with a compass and straightedge using a different method.



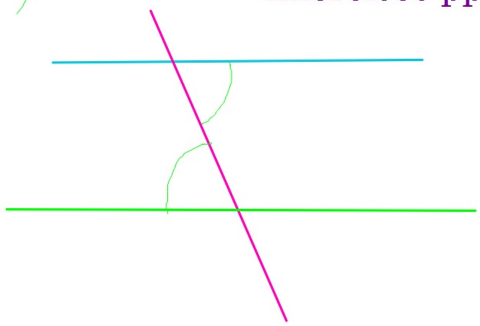
IWBAT discover methods of constructing parallel lines.

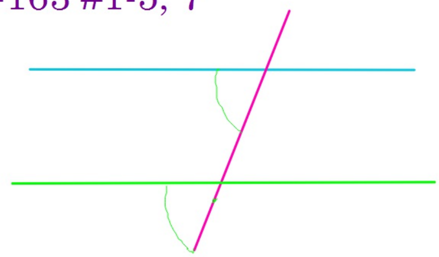
Constructing Parallel Lines

1)

2)

Exercises pp. 162-163 #1-5, 7





IWBAT discover methods of constructing parallel lines.

Constructing Triangles

10/05/16

IWBAT explore through construction whether or not a triangle can be determined given certain parts.

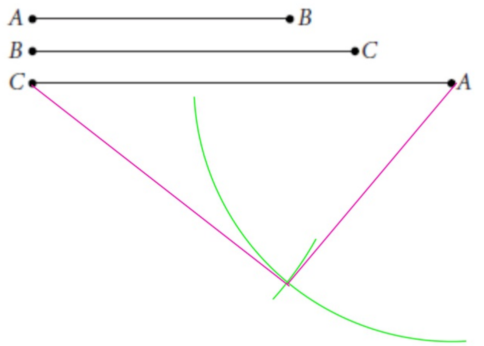
Constructing Triangles

10/05/16

To determine is to cause something to occur in a particular way or to establish exactly.

Construct $\triangle ABC$ using the three segments $\overline{AB}$, $\overline{BC}$, and $\overline{CA}$ shown below. How many different-size triangles can be drawn?

p. 168

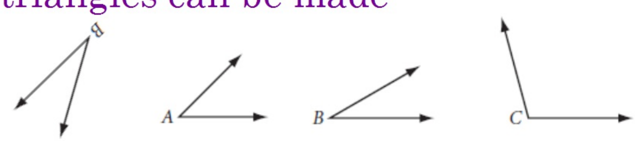


As long as $AB+BC > AC$ you can make a triangle

IWBAT explore through construction whether or not a triangle can be determined given certain parts.

Constructing Triangles

Construct triangle ABC by copying the three angles shown. How many different size triangles can be made from these three angles?



infinitely many similar triangles

IWBAT explore through construction whether or not a triangle can be determined given certain parts.

Constructing Triangles

Exercises p. 169-170 #1-6

IWBAT explore through construction whether or not a triangle can be determined given certain parts.

Slopes of Parallel & Perpendicular Lines 10/06/16

IWBAT investigate the relationship between the slopes of parallel lines and perpendicular lines.

Slopes of Parallel & Perpendicular Lines 10/06/16

Parallel Slope Property

In a coordinate plane, two distinct lines are parallel if and only if their slopes are equal.

Perpendicular Slope Property

In a coordinate plane, two nonvertical lines are perpendicular if and only if their slopes are negative reciprocals of each other.

IWBAT investigate the relationship between the slopes of parallel lines and perpendicular lines.

Slopes of Parallel & Perpendicular Lines

Consider A(-15, -6), B(6, 8), C(4, -2), and D(-4, 10). Are $\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$ parallel, perpendicular, or neither?

A(-15, -6)
B(6, 8)

C(4, -2)
D(-4, 10)

$$\frac{\text{Rise}}{\text{Run}} = \frac{-6-8}{-15-6} = \frac{-14}{-21} = \frac{2}{3}$$

$$\frac{-2-10}{4+4} = \frac{-12}{8} = \frac{-3}{2}$$

$$\frac{y_2-y_1}{x_2-x_1}$$

AB $\frac{2}{3}$

CD $-\frac{3}{2}$

Perpendicular

IWBAT investigate the relationship between the slopes of parallel lines and perpendicular lines.

Slopes of Parallel & Perpendicular Lines

Given points E(-3, 0), F(5, -4), and Q(4, 2), find the coordinates of a point P such that $\overleftrightarrow{PQ}$ is parallel to $\overleftrightarrow{EF}$.

E(-3,0)
F(5,-4)

$\frac{-4-0}{5--3} = \frac{-4}{8} = \frac{-1}{2}$

Q(4,2)
P(x,y)

P(6,1)

$\frac{y-2}{x-4} = \frac{-1}{2}$

$y-2=-1$
$\;+2\quad +2$
$y=1$

$x-4=2$
$\;+4\quad +4$
$x=6$

IWBAT investigate the relationship between the slopes of parallel lines and perpendicular lines.

Slopes of Parallel & Perpendicular Lines

Exercises p. 167 #1-4, 7, 10, 12

IWBAT investigate the relationship between the slopes of parallel lines and perpendicular lines.

IWBAT learn about transformations; identify and create translations, rotations, and reflections in the plane; apply the concepts of reflectional, rotational, and translational symmetry; and discover symmetries of regular polygons.

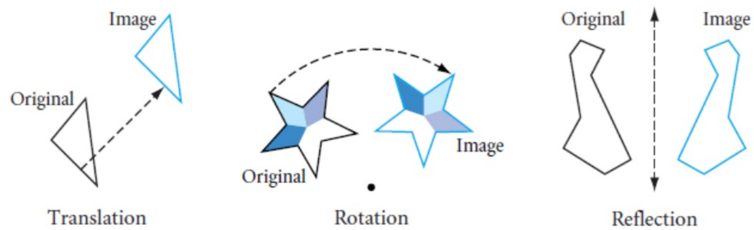
By moving all the points of a geometric figure according to certain rules, you can create an image of the original figure. This process is called transformation.

A transformation that does not preserve the size and shape is called nonrigid transformation (e.g. reduction/shrink, enlargement, stretch).

IWBAT learn about transformations; identify and create translations, rotations, and reflections in the plane; apply the concepts of reflectional, rotational, and translational symmetry; and discover symmetries of regular polygons.

Transformations and Symmetry

If the image is congruent to the original figure, the process is called rigid transformation, or isometry.



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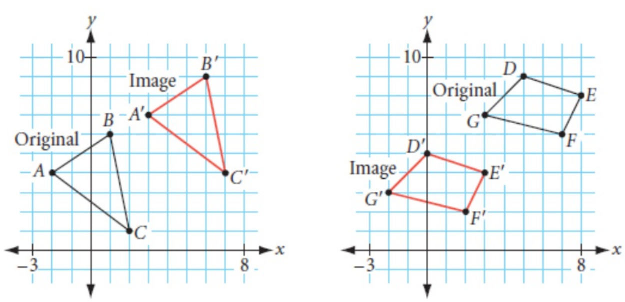
Transformations and Symmetry

Translation is the simplest type of isometry. Notice that when you slide the figure, all points move the same distance along parallel paths to form its image. That is, each point in the image is equidistant from the point that corresponds to it in the original figure. This distance, because it is the same for all points, is called the distance of the translation.



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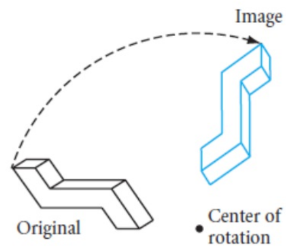
Transformations and Symmetry

Rotation is another type of isometry. In a rotation, all the points in the original figure rotate, or turn, an identical number of degrees about a fixed center point. You can define a rotation by its center point, the number of degrees it's turned, and whether it's turned clockwise or counterclockwise. If no direction is given, assume the direction of rotation is counterclockwise.

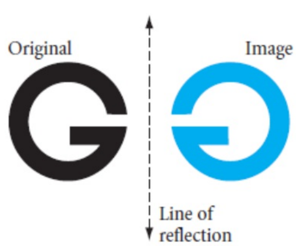


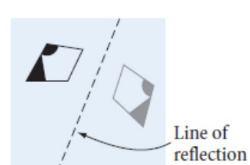
IWBAT learn about transformations; identify and create translations, rotations, and reflections in the plane; apply the concepts of reflectional, rotational, and translational symmetry; and discover symmetries of regular polygons.

Transformations and Symmetry

Reflection is a type of isometry that produces a figure's "mirror image." If you draw a figure onto a piece of paper, place the edge of a mirror perpendicular to your paper, and look at the figure in the mirror, you will see the reflected image of the figure. The line where the mirror is placed is called the **line of reflection.**

Reflection is a type of isometry that produces a figure's "mirror image". If you draw a figure onto a piece of paper, place the edge of a mirror perpendicular to your paper, and look at the figure in the mirror, you will see the reflected image of the figure. The line where the mirror is placed is called the line of reflection.



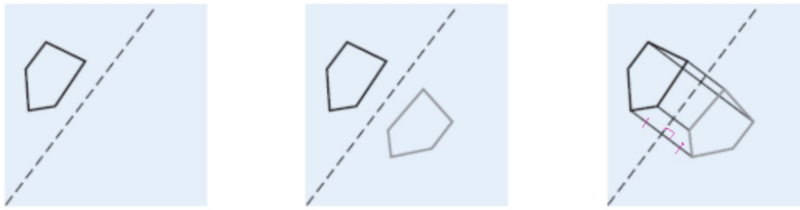


IWBAT learn about transformations; identify and create translations, rotations, and reflections in the plane; apply the concepts of reflectional, rotational, and translational symmetry; and discover symmetries of regular polygons.

Transformations and Symmetry

Reflection Line Conjecture

The line of reflection is the perpendicular bisector of every segment joining a point in the original figure with its image.



Step 1 Step 2 Step 3

IWBAT learn about transformations; identify and create translations, rotations, and reflections in the plane; apply the concepts of reflectional, rotational, and translational symmetry; and discover symmetries of regular polygons.

Transformations and Symmetry

If a figure can be reflected over a line in such a way that the resulting image coincides with the original, then the figure has reflectional symmetry. The reflection line is called the line of symmetry. The Navajo rug shown below has two lines of symmetry.

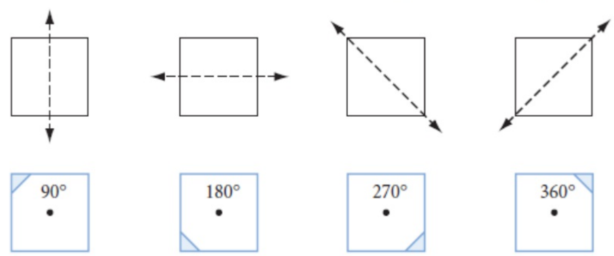
The letter *T* has reflectional symmetry. You can test a figure for reflectional symmetry by using a mirror or by folding it.

IWBAT learn about transformations; identify and create translations, rotations, and reflections in the plane; apply the concepts of reflectional, rotational, and translational symmetry; and discover symmetries of regular polygons.

Transformations and Symmetry

If a figure can be rotated about a point in such a way that its rotated image coincides with the original figure before turning a full 360°, then the figure has rotational symmetry. We don't call a figure symmetric if this is the *only* kind of symmetry it has.

Some polygons have no symmetry, or only one kind of symmetry. Regular polygons, however, are symmetric in many ways. A square, for example, has 4-fold reflectional symmetry and 4-fold rotational symmetry.



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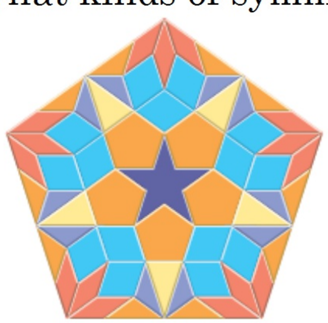
Transformations and Symmetry

What kinds of symmetry, if any, do these figures have?



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Transformations and Symmetry

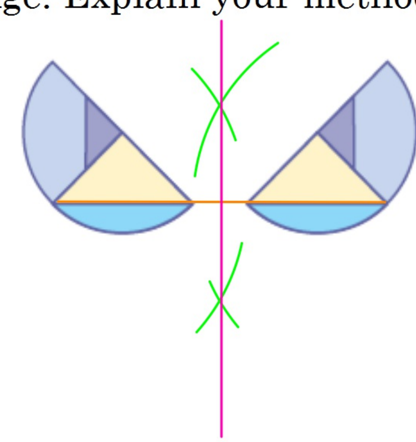
Parallel & perpendicular lines
Exercises p. 167 #1-4, 10, 12

Transformations & Symmetry
Exercises pp. 362-363 #1-3, 7, 8, 10, 12-14

IWBAT learn about transformations; identify and create translations, rotations, and reflections in the plane; apply the concepts of reflectional, rotational, and translational symmetry; and discover symmetries of regular polygons.

Complete p. 363 #9b to turn in with complete header.

Copy the figure and its reflected image onto a sheet of paper. Locate the line of reflection using a compass and straightedge. Explain your method.



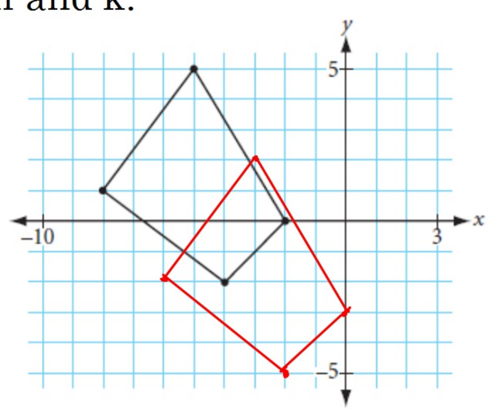
IWBAT find a minimal path using reflections.

Properties of Isometries 10/11/16

You can use ordered pair rules to transform polygons on a coordinate plane by relocating their vertices. For any point on a figure, the ordered pair rule $(x, y) \rightarrow (x + h, y + k)$ results in a horizontal move of h units and a vertical move of k units for any numbers h and k.

Transform the polygon at right using the rule $(x, y) \rightarrow (x + 2, y - 3)$. Describe the type and direction of the transformation.

Translated
right 2
down 3



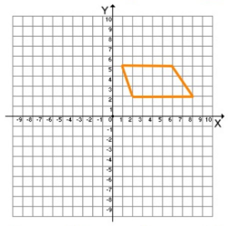
IWBAT find a minimal path using reflections.

Properties of Isometries

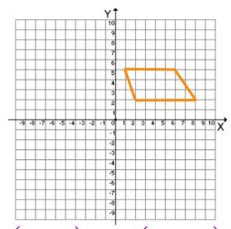
On graph paper, label four sets of coordinate axes. Draw the same polygon in the same position in a quadrant of each of the four graphs. Write one of these four ordered pair rules below each graph.

a. (x, y) → (-x, y)
b. (x, y) → (x, -y)
c. (x, y) → (-x, -y)
d. (x, y) → (y, x)

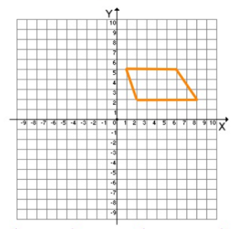
Use the ordered pair rule you assigned to each graph to relocate the vertices of your polygon and create its image.



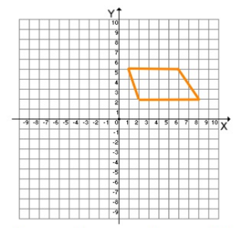
(x, y) → (-x, y)



(x, y) → (x, -y)



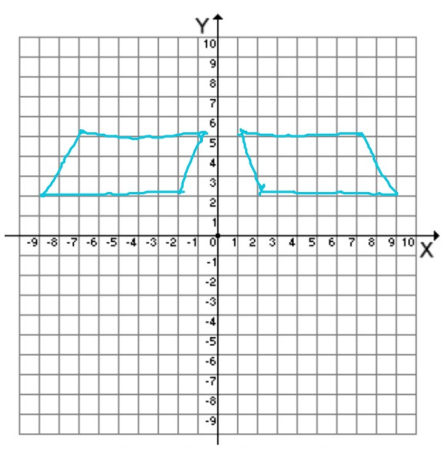
(x, y) → (-x, -y)



(x, y) → (y, x)

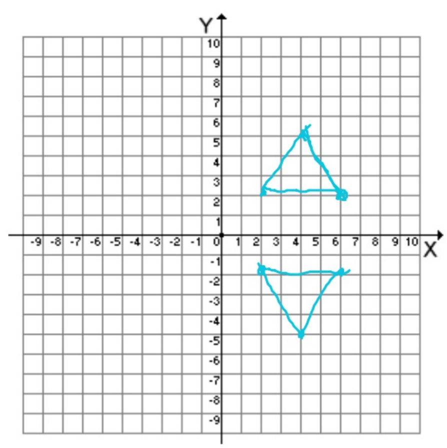
IWBAT find a minimal path using reflections.

Properties of Isometries



(x, y) → (-x, y)

Reflection across the y-axis

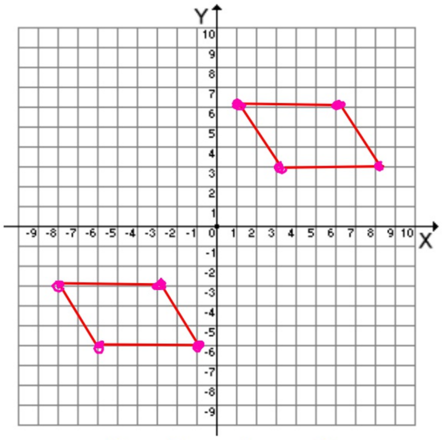


(x, y) → (x, -y)

Reflection across the x-axis

IWBAT find a minimal path using reflections.

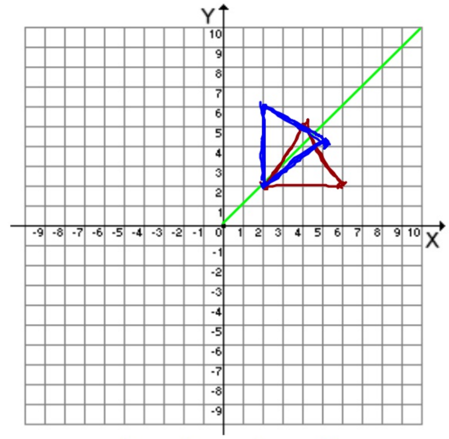
Properties of Isometries



(x, y) → (-x, -y)

Reflected across both axes

Rotated about the origin 180°



(x, y) → (y, x)

Reflected across y=x

IWBAT find a minimal path using reflections.

Properties of Isometries

Coordinate Transformations Conjecture

The ordered pair rule (x, y) → (-x, y) is a reflection over the y-axis.

The ordered pair rule (x, y) → (x, -y) is a reflection over the x-axis.

The ordered pair rule (x, y) → (-x, -y) is a rotation about the origin 180°.

The ordered pair rule (x, y) → (y, x) is a reflection over the line y=x.

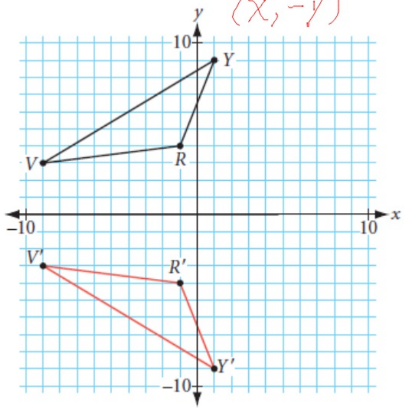
IWBAT find a minimal path using reflections.

Properties of Isometries

Exercises p. 371 #7 & 8

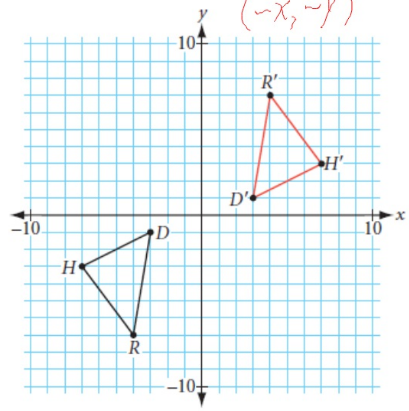
7. (x, y) → (? ,?)

(x, -y)



8. (x, y) → (? ,?)

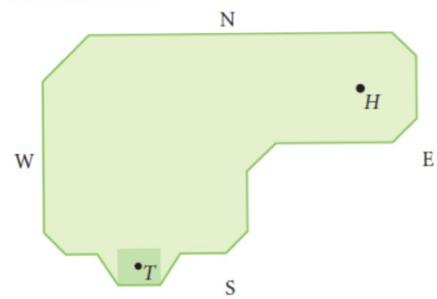
(-x, -y)

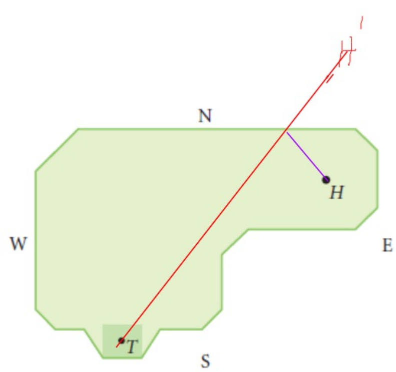


Properties of Isometries

With a partner, follow the steps of Example B pp. 369-370 to answer #10 from p. 371.

10. Starting from the tee (point T), what point on a wall should a player aim for so that the golf ball bounces off the wall and goes into the hole at H?

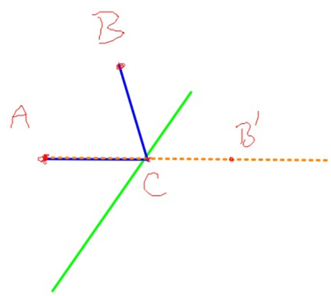


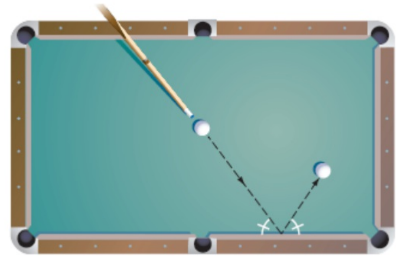


IWBAT find a minimal path using reflections.

Properties of Isometries

Perform Investigation 2 p. 367





IWBAT find a minimal path using reflections.

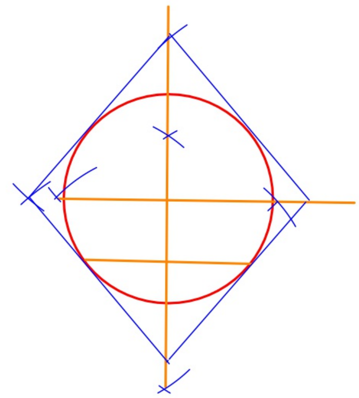
Properties of Isometries

Exercises p. 371 #9 & 11

IWBAT find a minimal path using reflections.

DIKHBCXEO Exercises p. 372 #15 & 20

BOXED
CHOKE
CHIDE
EXIDE
OXIDE
BOXEO



Compositions of Transformations 10/14/16

IWBAT discover the result of reflecting a figure over two parallel lines and over two intersecting lines and learn about glide reflections.

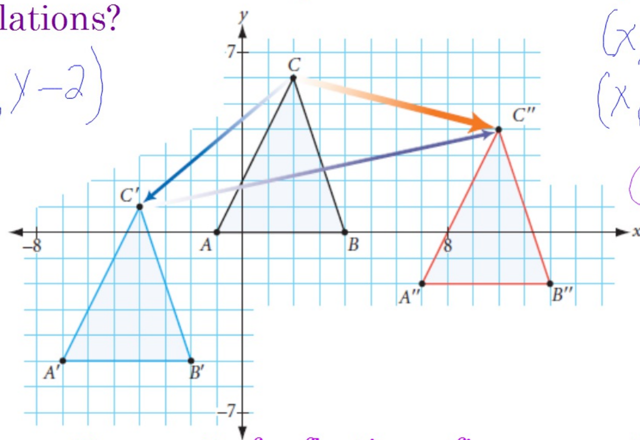
Compositions of Transformations

10/14/16

When you apply one transformation to a figure and then apply another transformation to its image, the resulting transformation is called a composition of transformations.

Triangle ABC with vertices A(-1, 0), B(4, 0), and C(2, 6) is first translated by the rule (x, y) → (x - 6, y - 5), and then its image, triangle A'B'C', is translated by the rule (x, y) → (x + 14, y + 3). What single translation is equivalent to the composition of these two translations?

$(x, y) \rightarrow (x+8, y-2)$



$(x, y) \rightarrow (x-6, y-5)$

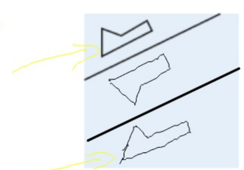
$(x, y) \rightarrow (x+14, y+3)$ +

$(x, y) \rightarrow (x+8, y-2)$

IWBAT discover the result of reflecting a figure over two parallel lines and over two intersecting lines and learn about glide reflections.

Compositions of Transformations

Complete Investigation 1 p. 374 with a partner. Work together to complete one drawing and then replicate it on partner 2's patty paper. Look for ways to complete the conjecture below.



Your image does not have to look like this one, but it must be obvious that it is reflected.

Reflections over Parallel Lines Conjecture

A composition of two reflections over two parallel lines is equivalent to a single translation. In addition, the distance from any point to its second image under the two reflections is twice the distance between the parallel lines.

IWBAT discover the result of reflecting a figure over two parallel lines and over two intersecting lines and learn about glide reflections.

Compositions of Transformations

Complete Investigation 2 p. 375 with a <u>different</u> partner. Work together to complete one drawing and then replicate it on partner 2's patty paper. Look for ways to complete the conjecture below.

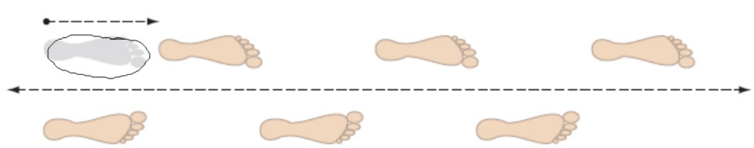
Reflections over Intersecting Lines Conjecture

A composition of two reflections over a pair of intersecting lines is equivalent to a single rotation. The angle of rotation is twice the acute angle between the pair of intersecting reflection lines.

IWBAT discover the result of reflecting a figure over two parallel lines and over two intersecting lines and learn about glide reflections.

Compositions of Transformations

Combining a translation with a reflection gives a special two-step transformation called a glide reflection.



IWBAT discover the result of reflecting a figure over two parallel lines and over two intersecting lines and learn about glide reflections.

Compositions of Transformations

Exercises p. 376 #3, 4, 7

IWBAT discover the result of reflecting a figure over two parallel lines and over two intersecting lines and learn about glide reflections.

What should be in your notebook for practice problems:

Exercises DG p. 145 #1-8, 10

Exercises DG pp. 149-150 #1-5, 7, 8

Exercises DG pp. 154-155 #1-5, 10-12

Exercises DG pp. 158-159 #1-8 all

Exercises pp. 162-163 #1-5, 7

Exercises pp. 169-170 #1-6

Exercises p. 167 #1-4, 10, 12

Exercises pp. 362-363 #1-3, 7, 8, 10, 12-14

Exercises p. 371 #9 & 11

Exercises p. 376 #3, 4, 7

To be successful on the unit test, you should be able to complete questions like the following:

Exercises pp. 192-193 #19-24, 27-30, 33-36, 58-59